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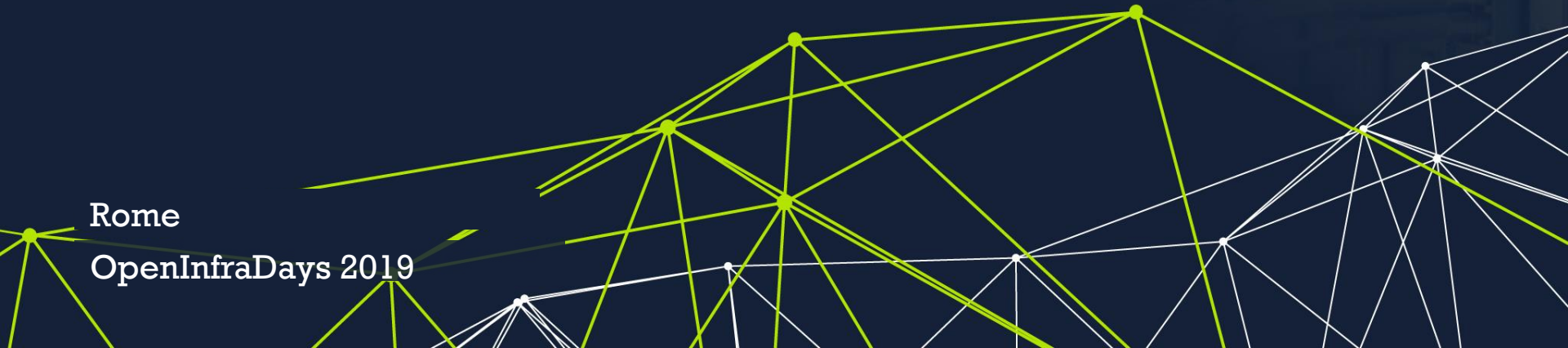
Consortium GARR
THE ITALIAN EDUCATION & RESEARCH NETWORK

No Check Left Behind

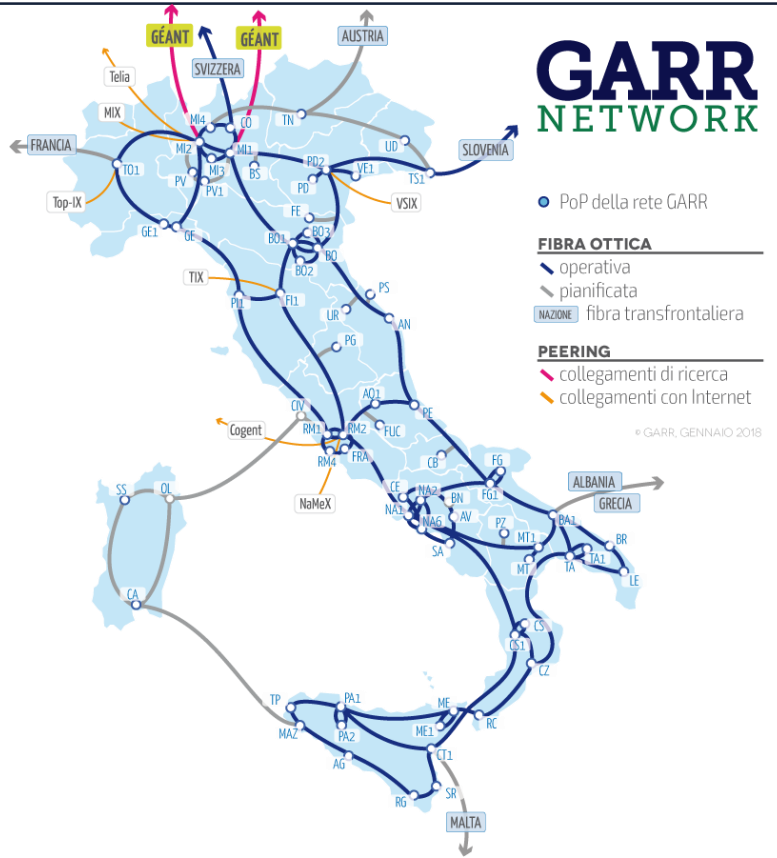
Claudio Pisa - GARR



Rome

OpenInfraDays 2019

Consortium GARR



- Italian NREN (National Research and Education Network)
  - nonprofit organization
  - connected to GÉANT
- High speed network
  - 1000+ locations
  - ~4.5 million users
    - teachers, researchers, students
  - 15,000 km of optical fiber
  - 380 Petabyte Yearly Traffic

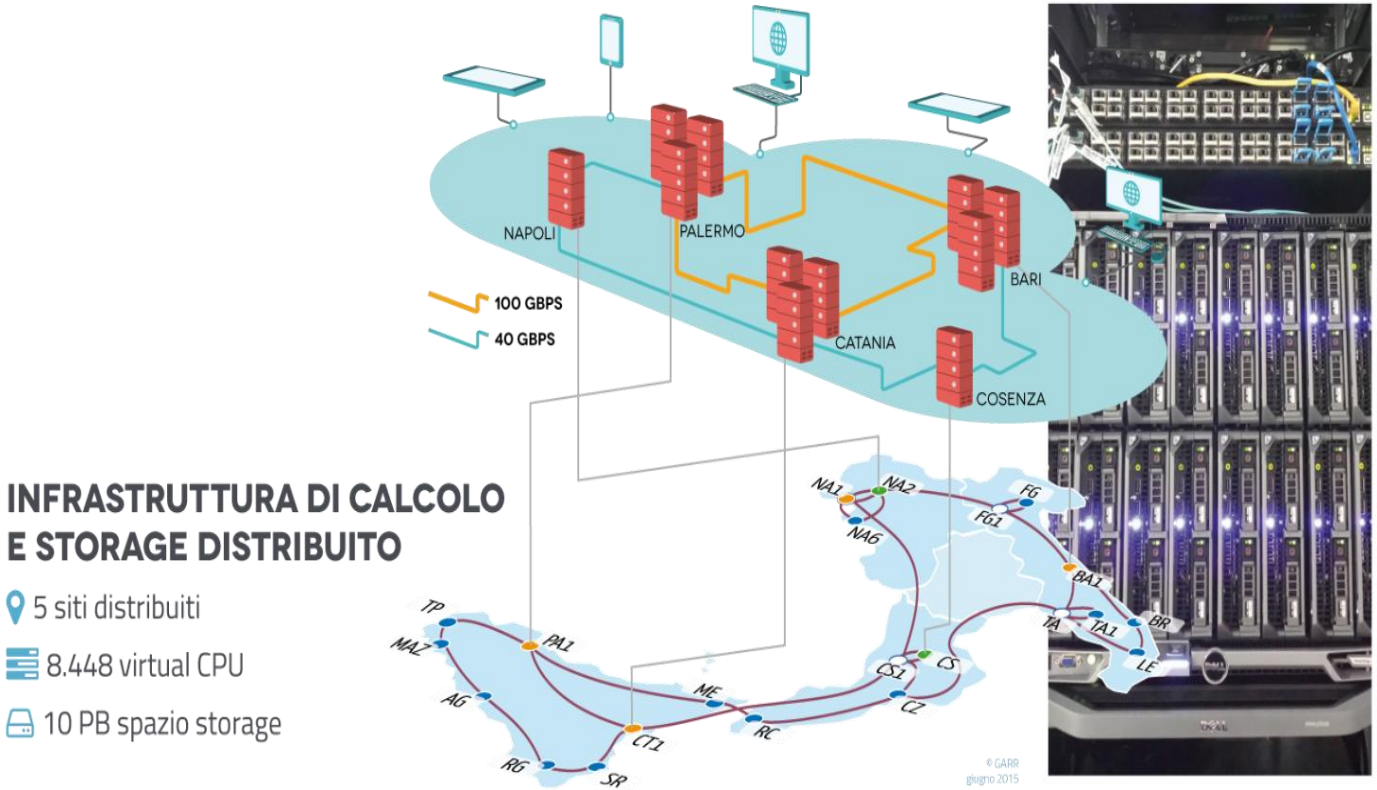
Consiglio Nazionale delle Ricerche

ENEA

INFN Istituto Nazionale di Fisica Nucleare

Fondazione CRUI

GARR Computing and Storage



INFRASTRUTTURA DI CALCOLO E STORAGE DISTRIBUITO

- 5 siti distribuiti
- 8.448 virtual CPU
- 10 PB spazio storage

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Juju

- Tool for the deployment, configuration and management of services on public and private cloud infrastructures
- Free and open source
- Exposes a high-level declarative language
- **Charms**
  - script collections
  - can be written in any scripting/programming language
  - collected on the Juju store
- Juju orchestrates the deployment, composition and scaling of Charms

Monitoring - day 0 (one year ago)

- Different monitoring systems:
  - Nagios
    - OpenStack services
  - Zabbix
    - Ceph
    - Hardware sensors
- Some systems not monitored

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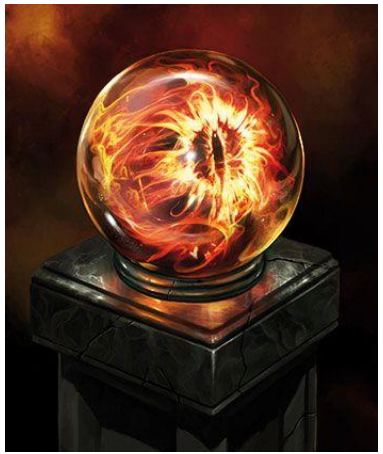
Objective

Objective:
build a unified comprehensive dashboard



State of the art:
Grafana

Considerations

- Existing monitoring systems seem to be doing their job well
  - the right tool for the right job
- What is missing is just a single viewpoint
- Grafana seems to have what we need

Grafana

- **Grafana** is a platform for data visualization, querying and alerting
- Several pluggable data sources:
  - Zabbix
  - PNP (Nagios)
  - Prometheus
  - Gnocchi
  - Monasca
  - JSON (general purpose)
  - MySQL / PostgreSQL (general purpose)
- Data from heterogeneous sources can be mixed in the same dashboard

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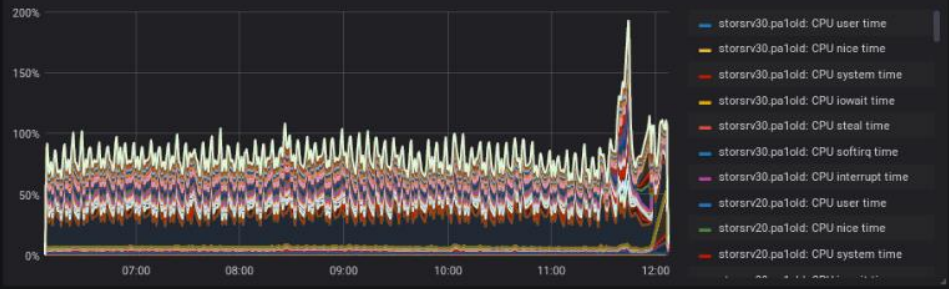
Zabbix → Grafana

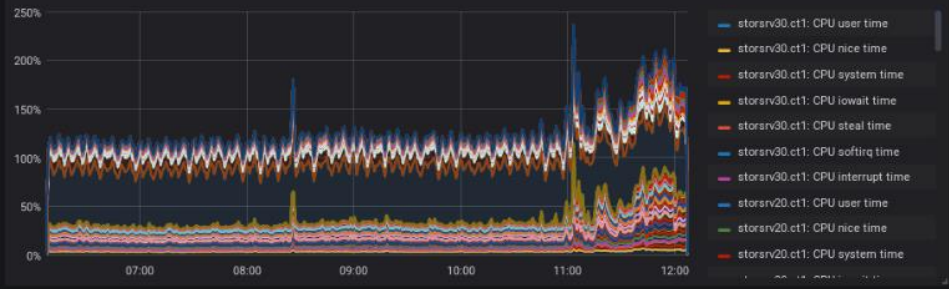
- Zabbix
  - “batteries included” free and open source monitoring tool
  - auto discovery
  - XML based templates
  - remote agents
  - Good Ceph integration
  - Good multiuser support
- Straightforward integration with Grafana
  - Grafana’s Zabbix datasource

Ceph

Ceph PA

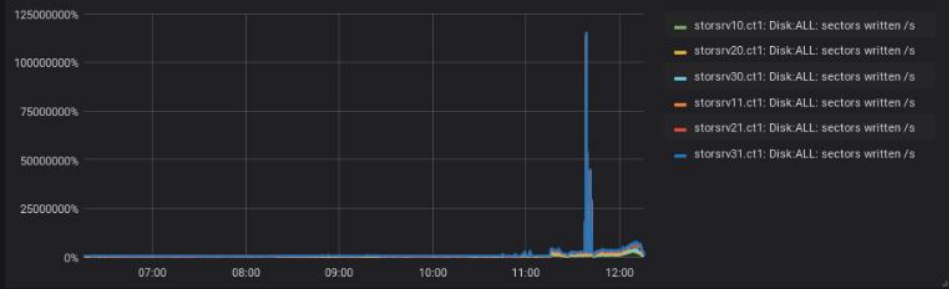


Ceph CT

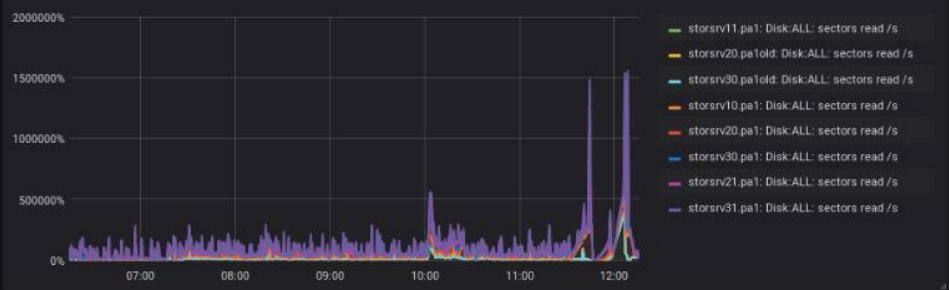


Ceph PA sectors written

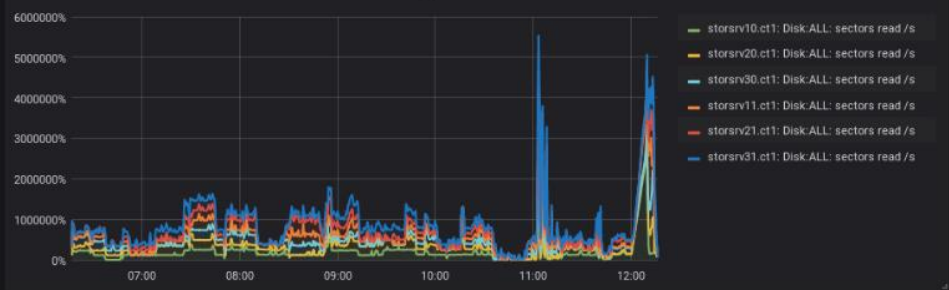
Ceph CT sectors written



Ceph PA sectors read



Ceph CT sectors read



Zabbix Server *(7 panels)*

Nagios

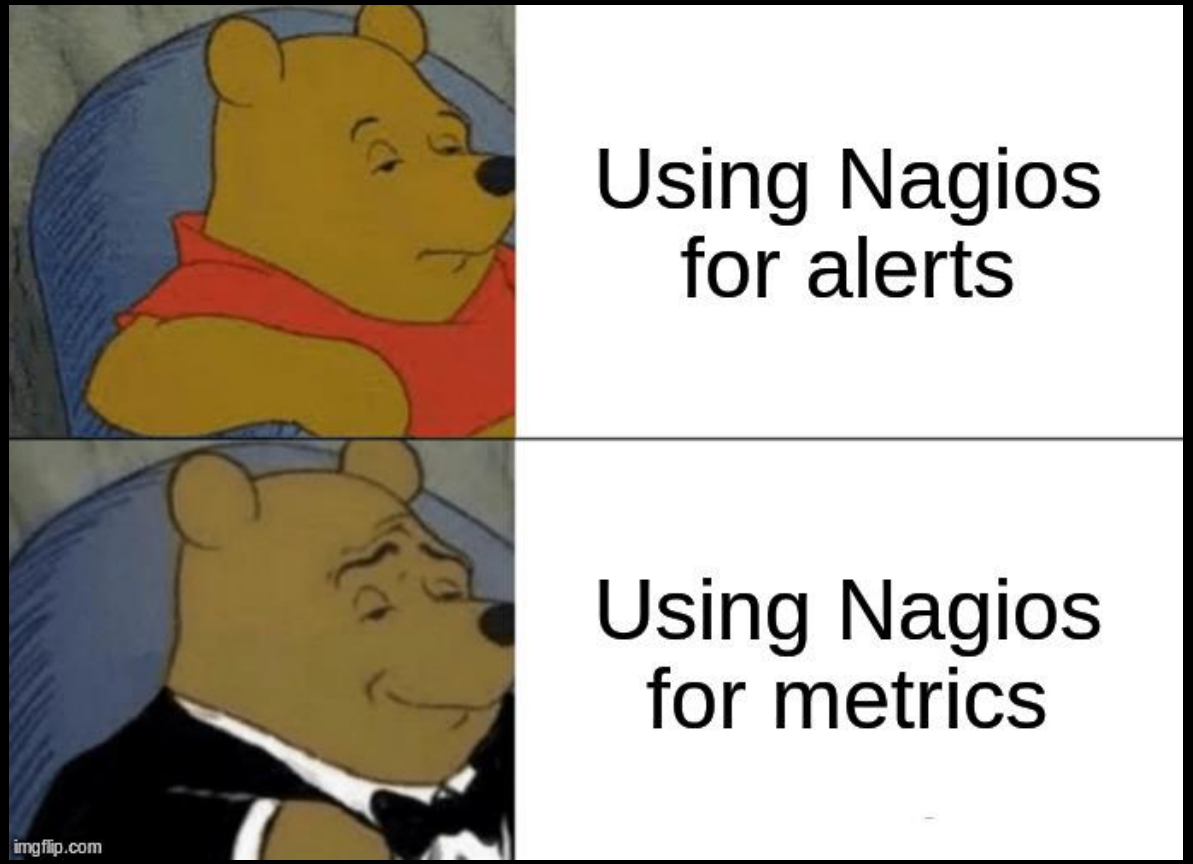
- **Nagios** is a free and open source monitoring tool
  - plugins - scripts to check and report
  - Nagios remote plugin executor (NRPE) - for remote hosts
  - known especially for alerting
  - FAQ: how do you pronounce Nagios?
    - the author pronounces it as “nah-ghee-ose”
    - but “you can pronounce it however the heck you'd like”
    - even “nachos”

Nagios

- Nagios is very well integrated in Juju
  - Nagios charm
  - NRPE charm
  - Canonical OpenStack charms come with handy Nagios configuration options

PNP my Nagios

- PNP is an addon to Nagios which analyzes performance data provided by Nagios plugins and stores them automatically into Round Robin Databases (RRD)
  - and there is a PNP Grafana datasource


Using Nagios for alerts
Using Nagios for metrics
imgflip.com

OpenStack → Nagios

- The Nagios Charm monitors the OpenStack services
  - but not what is happening inside OpenStack
- Simple idea: **write a set of Nagios plugins which collect metrics from the OpenStack API**
  - number of projects
  - number of servers
  - floating IP address usage
  - volume usage
  - OpenStack APIs reachability
  - ...

CT1 →

Allocated VCPUs CT1

Allocated RAM CT1

Taken Public IPs CT1

Active instances CT1

551

Volume Usage CT1

340 TB

Active compute hosts CT1

24

PA1 →

Allocated VCPUs PA1

Allocated RAM PA1

Taken Public IPs PA1

Active instances PA1

552

Volume Usage PA1

183 TB

Active compute hosts PA1

16

NA2 →

Allocated VCPUs NA2

Allocated RAM NA2

Taken Public IPs NA2

Active instances NA2

34

Volume Usage NA2

1.925 TB

Active compute hosts NA2

3

Active users

614

Active Projects

935

Demo projects

602

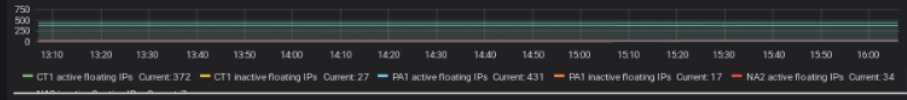
vDCs

47

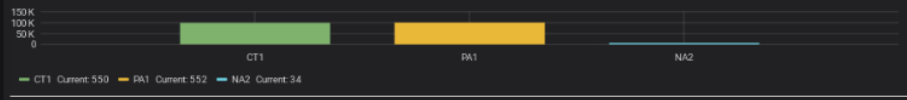
Active images

474

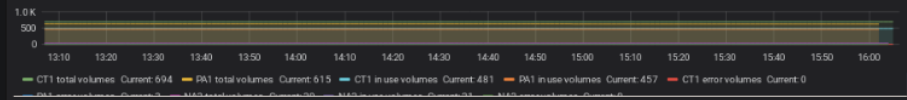
Floating IPs



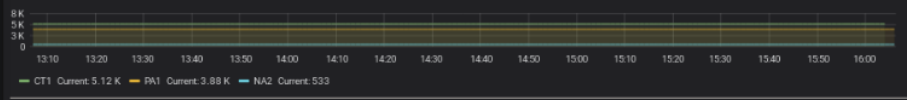
Active Instances



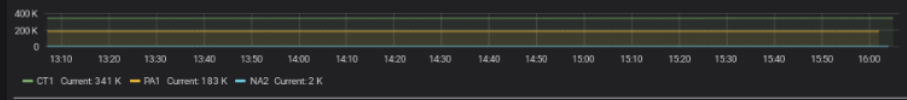
Active volumes



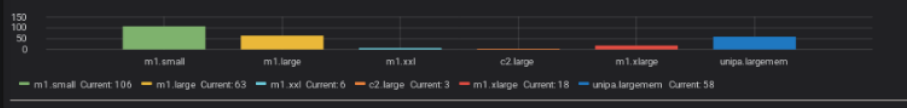
Total RAM Usage (GiB)



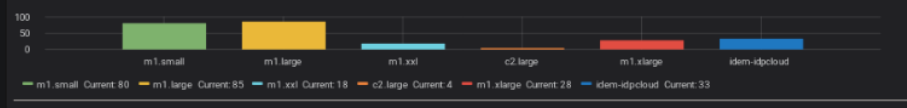
Total volume usage (GiB)

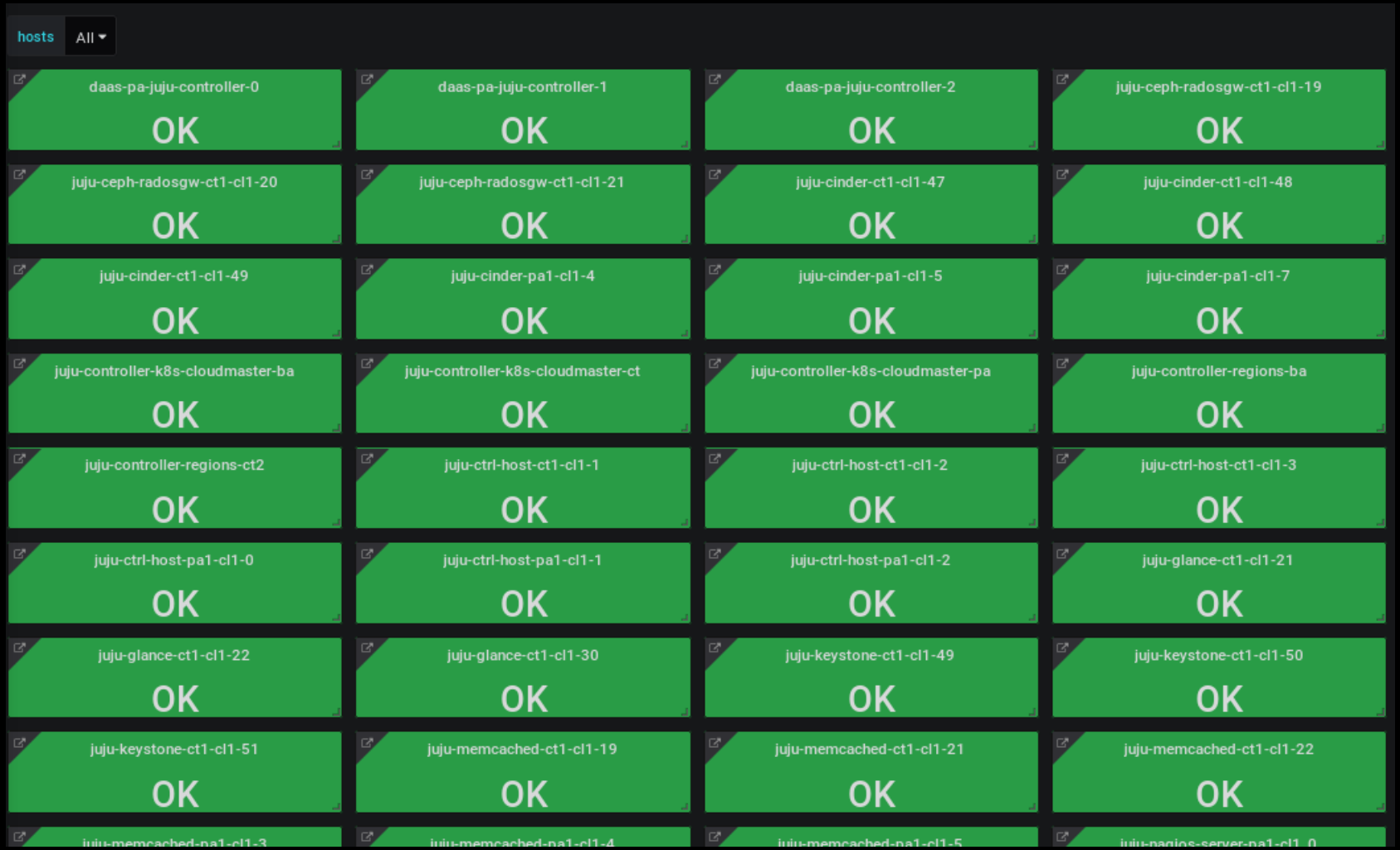


Flavor Distribution CT1



Flavor Distribution PA1




hosts
All
daas-pa-juju-controller-0
OK
daas-pa-juju-controller-1
OK
daas-pa-juju-controller-2
OK
juju-ceph-radosgw-ct1-cl1-19
OK
juju-ceph-radosgw-ct1-cl1-20
OK
juju-ceph-radosgw-ct1-cl1-21
OK
juju-cinder-ct1-cl1-47
OK
juju-cinder-ct1-cl1-48
OK
juju-cinder-ct1-cl1-49
OK
juju-cinder-pa1-cl1-4
OK
juju-cinder-pa1-cl1-5
OK
juju-cinder-pa1-cl1-7
OK
juju-controller-k8s-cloudmaster-ba
OK
juju-controller-k8s-cloudmaster-ct
OK
juju-controller-k8s-cloudmaster-pa
OK
juju-controller-regions-ba
OK
juju-controller-regions-ct2
OK
juju-ctrl-host-ct1-cl1-1
OK
juju-ctrl-host-ct1-cl1-2
OK
juju-ctrl-host-ct1-cl1-3
OK
juju-ctrl-host-pa1-cl1-0
OK
juju-ctrl-host-pa1-cl1-1
OK
juju-ctrl-host-pa1-cl1-2
OK
juju-glance-ct1-cl1-21
OK
juju-glance-ct1-cl1-22
OK
juju-glance-ct1-cl1-30
OK
juju-keystone-ct1-cl1-49
OK
juju-keystone-ct1-cl1-50
OK
juju-keystone-ct1-cl1-51
OK
juju-memcached-ct1-cl1-19
OK
juju-memcached-ct1-cl1-21
OK
juju-memcached-ct1-cl1-22
OK

Kubernetes → Prometheus → Grafana

- A new kid on the block: Kubernetes
  - container platform
  - inspired by **Google Borg**
- Prometheus
  - open source monitoring tool
  - inspired by the **Google Borg Monitor**
  - powerful query language (PromQL)
  - alerting
  - white-box monitoring
- Kubernetes supports Prometheus natively
- Grafana supports Prometheus natively

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Instance All | Namespace kube-system

all pods

Memory Working Set

Last 1 minute

Cpu Usage

Last 1 minute

Filesystem Usage

Last 1 minute

Used	Total
49.17 GiB	1.60 TiB

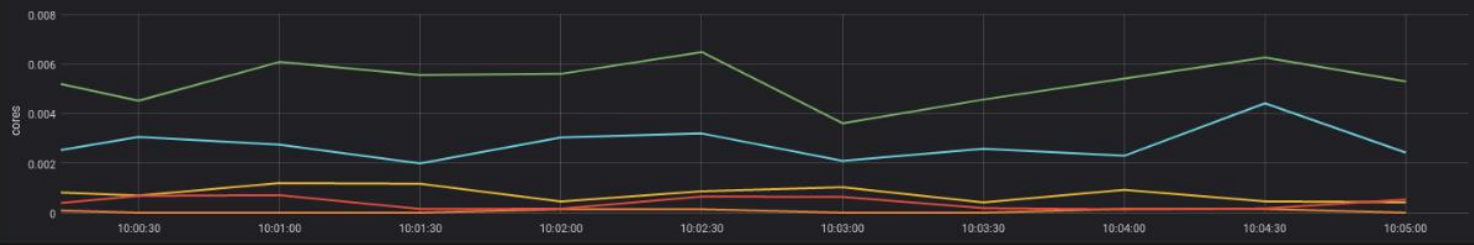
Used	Total
3.29 cores	224.00 cores

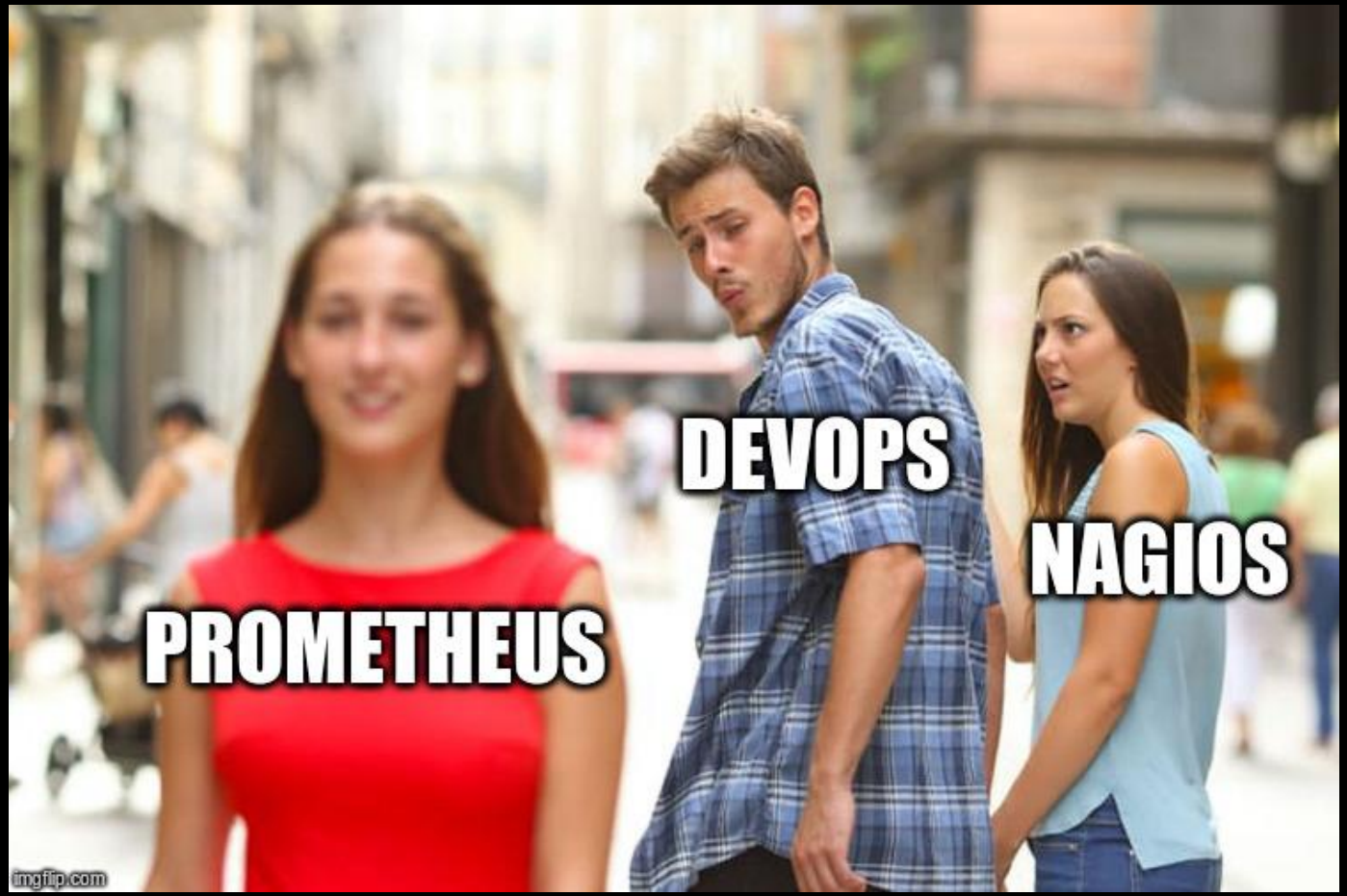
Used	Total
529.09 GiB	2.39 TiB

Network

each pod

Cpu Usage




DEVOPS
NAGIOS
PROMETHEUS
imgflip.com

Considerations / Takeaways

- Nagios (vs. Prometheus)
  - Nagios has no query language
    - but it is very easy to develop new plugins
  - Nagios (+PNP) uses RRD based storage
    - not suitable for highly dynamic environments
      - e.g. cloud-native applications
    - but suitable for infrastructure monitoring
- Grafana performance (time to render graphs)
  - very good with Nagios+PNP
  - OK with Zabbix
  - can be slow with Prometheus

Future Work

- Self healing
  - react to well known bugs
  - with well known recipes
  - with some hysteresis / guard time
- AIOps - Artificial Intelligence for Operations
  - collect many many metrics
  - annotate incidents/events
  - train an AI using the collected data
  - profit!

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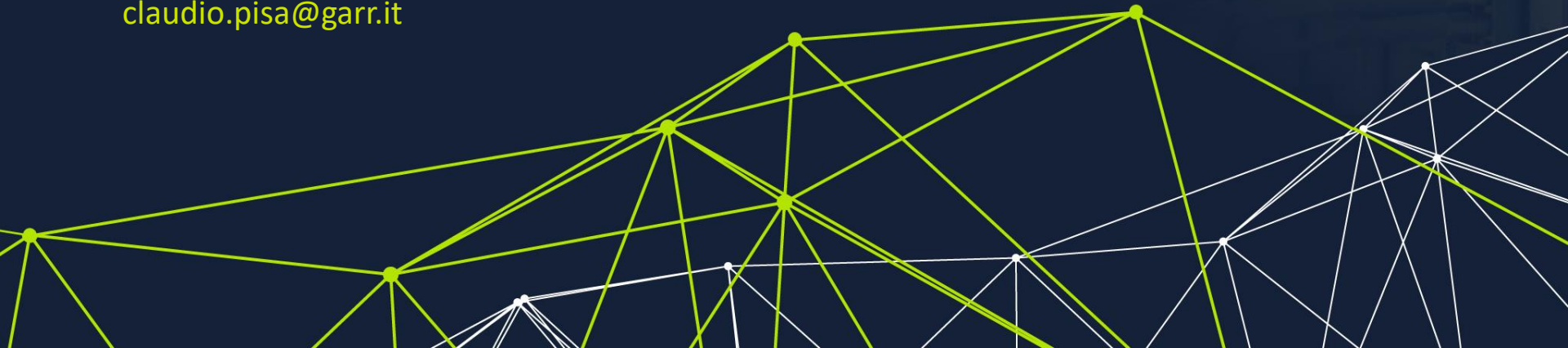
Thank you

Claudio Pisa - GARR - Distributed Computing and Storage Department

claudio.pisa@garr.it